

A Compact Trace Gas Lidar for Simultaneous Measurements of Methane and Water Vapor Column Abundance

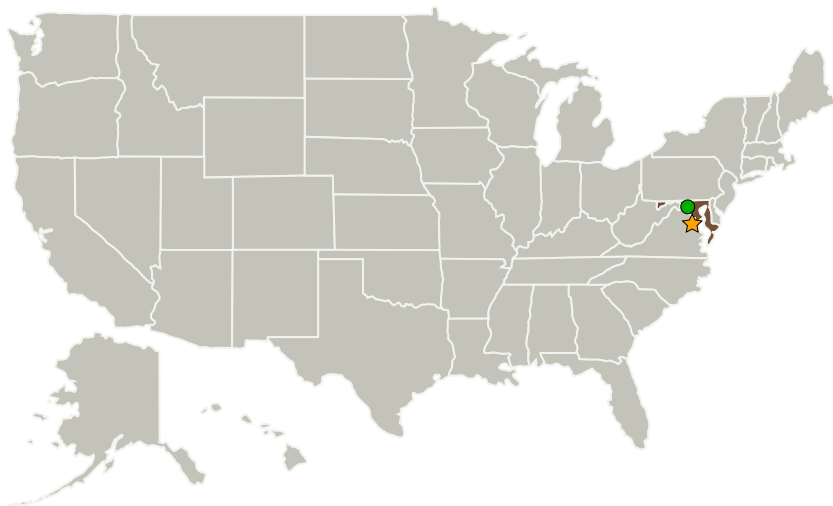
Completed Technology Project (2015 - 2018)



Project Introduction

Methane is the second most important anthropogenic greenhouse gas. Understanding current global methane trends is a difficult challenge that cannot be resolved by existing measurement networks or satellite observations. Our proposed technology will directly address the objectives of NASA's Earth Science Decadal Survey which called explicitly for cost-effective global methane measurement technology and will enable global CH₄ and H₂O measurements with sufficient coverage, sensitivity, and precision to address pressing science questions for the carbon cycle and climate change. For this effort we propose to advance the technology readiness level for a CH₄/H₂O lidar operating at 1651 nm that can measure methane with very high spatial resolution and precision and extend the measurement to water vapor. Specifically we are proposing to: 1) Scale the laser transmitter energy to 300 μ J and package the transmitter for a future airborne demonstration. 2) Measure methane column abundance with a 1% precision. 3) Extend the wavelength coverage to detect water vapor. 4) Advance the technology readiness level (TRL) of our laboratory instrument from TRL 3 to TRL 6. The proposed work will commence in February 2015 and conclude three years later. Our team is uniquely qualified for this work. Over the past decade our group at Goddard Space Flight Center has built lidars for several space missions and demonstrated a strong capability for the remote measurements of several trace gases on the ground and from airborne platforms. Our group was the first to demonstrate CH₄ column measurements from a high altitude aircraft.

Primary U.S. Work Locations and Key Partners



ALHAT - ETD Autonomous
Landing & Hazard Avoidance
Tech Earth Science Technology
Office

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Organizations Performing Work	Role	Type	Location
★ NASA Headquarters(HQ)	Lead Organization	NASA Center	Washington, District of Columbia
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland

Images



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ALHAT - ETD Autonomous Landing & Hazard Avoidance Tech Earth Science Technology Office
(<https://techport.nasa.gov/image/5101>)

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Center / Facility:

NASA Headquarters (HQ)

Responsible Program:

Advanced Component Technology Program

Project Management

Program Director:

Pamela S Millar

Program Manager:

Amber E Emory

Principal Investigator:

Haris Riris

Co-Investigators:

Kenji Numata
David T Leisawitz
Stewart T Wu
Stephan R Kawa

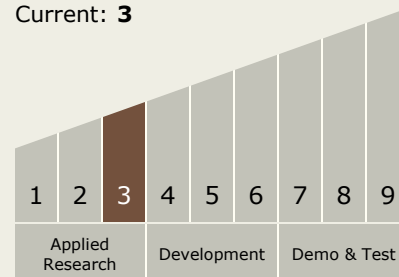
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Technology Maturity (TRL)

Start: 3
Current: 3



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.5 Lasers

Target Destination

Earth